

CLIPPEDIMAGE= JP362225629A

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TITLE: TURBID WATER-CIRCULATION TYPE DREDGER

PUBN-DATE: October 3, 1987

INVENTOR-INFORMATION:

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NAME	COUNTRY
NIPPON STEEL CORP	N/A

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INT-CL (IPC): E02F003/88

US-CL-CURRENT: 37/317

ABSTRACT:

PURPOSE: To prevent the pollution of sea water in and around the dredging area

by utilizing turbid water by circulation by a method in which excavation is

made by turning a cutter, the excavated sludge is discharged through a transport pipe to a separator, and mud water is dropped into a sedimentation tank.

CONSTITUTION: A drum-type cutter 5 is turned by a cutter driver 4, and a screw conveyer 31 is turned toward the central raking direction of excavated

sludge by a conveyer driver 32. The excavated sludge is made into a slurry with water by a pump 7 for discharging the excavated sludge and discharged through a suction pipe 8 and a transport pipe 9 onto the metal-net conveyer 40 of a separator 10 on a working ship 1. Mud water so separated is dropped into a sedimentation tank 3. The turbid water in a turbid water storage tank 39 is supplied to a box 6 for collecting and discharging the excavated sludge, sent to the separator 10 again, and utilized by circulation. The pollution of sea water by turbid water can thus be prevented during the dredging work.

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⑪発明の名称 汚濁水循環式浚渫装置

⑫特願 昭61-65814
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明細書

1. 発明の名称

汚濁水循環式浚渫装置

2. 特許請求の範囲

作業船1により起伏自在なブーム2を介して支持されて前進移動される移動フレーム3に、カッタ駆動装置4により回転されるカッタ5とそのカッタ5の後部に配置された掘削屑集合排出用ボックス6とが取付けられ、そのボックス6に掘削屑排出用ポンプ7の吸引管8が接続され、そのポンプ7の吐出口に接続された掘削屑輸送管9は、作業船1上に設けられた掘削屑と水との分離装置10に導かれ、その分離装置10の汚濁水貯留部と前記ボックス6とは、還流水ポンプ11を有する汚濁水還流管12を介して接続されていることを特徴とする汚濁水循環式浚渫装置。

3. 発明の詳細な説明

〔産業上の利用分野〕

この発明は、水底地盤を掘削する場合に使用する汚濁水循環式浚渫装置に関するものである。

〔従来技術〕

従来、水底地盤を浚渫する場合は、カッタにより掘削された掘削屑を、水と共に泥状化して浚渫作業船または土運船の泥艤に直接排出し、その泥艤内での沈殿によって土砂を内部に残留させ、上澄みの余剰水をオーバーフローにより海中に放流している。

〔発明が解決しようとする問題点〕

しかるに、前記余剰水は掘削物の微粒子を含む汚濁水であるので、その余剰水を海中に放流すると、浚渫区域周辺の海水が汚染され、海産業や環境に著しい悪影響を与えるという問題がある。

〔発明の目的、構成〕

この発明は前述の問題を有利に解決できる汚濁水循環式浚渫装置を提供することを目的とするものであつて、この発明の要旨とするところは、作業船1により起伏自在なブーム2を介して支持されて前進移動される移動フレーム3に、カッタ駆動装置4により回転されるカッタ5とそのカッタ5の後部に配置された掘削屑集合排出用ボックス

6とが取付けられ、そのボックス6に掘削屑排出用ポンプ7の吸引管8が接続され、そのポンプ7の吐出口に接続された掘削屑輸送管9は、作業船1上に設けられた掘削屑と水との分離装置10に導かれ、その分離装置10の汚濁水排出部と前記ボックス6とは、還流水ポンプ11を有する汚濁水還流管12を介して接続されていることを特徴とする汚濁水循環式浚渫装置にある。

〔実施例〕

次にこの発明を図示の例によつて詳細に説明する。

図面はこの発明の一実施例に係る汚濁水循環式浚渫装置を示すものであつて、作業船1の尾部にトラス構造のブーム2の基礎部が横軸により起伏自在に連結され、そのブーム2を構成する中空管体内にはブーム長手方向に並ぶように区画された多数の浮力調整室が設けられ、各浮力調整室に注排水弁が設けられ、その浮力調整室に対する注排水を行なつてブーム2の浮力を調整することにより、ブーム2の浮上、下向き傾斜およびブーム2

前記カツタ駆動装置4における非回転軸に一端部が固定されているアーム27の他端部は移動フレーム3に固定され、カツタ駆動装置4により回転されるドラムカツタユニット19, 22によりドラム型のカツタ5が構成されている。

ドラム型のカツタ5の後部において左右方向に延長するコンベヤ軸28における左側および右側に、左螺旋翼29および右螺旋翼30が固定されてスクリュコンベヤ31が構成され、そのスクリュコンベヤ31におけるコンベヤ軸28の両端部は移動フレーム3により軸受を介して支承され、コンベヤ軸28の両端にはケース回転型液圧モータからなるコンベヤ駆動装置32におけるケースに連結され、かつそのコンベヤ駆動装置32における非回転軸に一端部が固定されているアーム33の他端部は、前記移動フレーム3に固定されている。

前記スクリュコンベヤ31の中央部に配置された掘削屑集合排出用ボックス6の上部は移動フレーム3に固定され、そのボックス6の左右両側

の先端部に取付けられた浚渫装置の接地圧力の調整が行なわれる。

前記ブーム2の先端部に連結された支持枠13に移動フレーム3の前端部が横軸14により枢着され、かつ支持枠13と移動フレーム3の中間部とは傾斜調整用液圧シリンダ15を介して連結され、さらに左右方向に延長するカツタ支軸16の両端部は前記移動フレーム3に固定されている。

ドラム17の外周に多数の掘削刃18を左螺旋状に多数列並ぶように取付けて構成したドラムカツタユニット19と、ドラム20の外周に多数の掘削刃21を右螺旋状に多数列並ぶように取付けて構成したドラムカツタユニット22とは、直列に並ぶように配置されて前記カツタ支軸16により軸受23を介して回転自在に支承され、各ドラム17, 20に設けられた内歯歯車24に噛み合うビニオン25は、ケース回転型液圧モータからなるカツタ駆動装置4におけるケースに結合されている回転軸26に固定され、その回転軸26は移動フレーム3により軸受を介して支承され、か

に設けられた開口部34に左螺旋翼29および右螺旋翼30の接寄端部が挿入され、かつボックス6の外側にあるスクリュコンベヤ31の後部を囲む前方開口溝形断面の掘削屑誘導部材35は、スクリュコンベヤ31に沿つて延長するよう配置されて移動フレーム3およびボックス6の側面に固定され、前記掘削屑誘導部材35における円弧状溝底面は、左螺旋翼29および右螺旋翼30の後部に近接するよう配置されている。

前記移動フレーム3に固定された掘削屑排出用ポンプ7における吸引管8の吸入端部は、スクリュコンベヤ31よりも後方において前記ボックス6内に上方から挿通されて固定され、かつブーム2に沿つて延長する金属管36の一端部にホース37が接続されると共にその金属管の他端部にホースまたは屈折性管体が接続されて掘削屑輸送管9が構成され、前記金属管36がブーム2に固定されると共に、前記ホース37の端部が掘削屑排出用ポンプ7の吐出口に接続されている。

前記作業船1上に、沈没槽38とこれに隣接す

る汚濁水貯槽39とが設けられ、かつ沈殿槽38の上部には掘削屑と泥水とを分離するための金網コンベヤ40が設けられ、前記沈殿槽38と汚濁水貯槽39と金網コンベヤ40とにより分離装置10が構成されている。前記掘削屑輸送管9の排出端部は金網コンベヤ40における受入側端部の上部に配置され、かつ汚濁水貯槽39の汚濁水貯溜部に還流水ポンプ11が配置され、その還流水ポンプ11の吐出口に一端部が接続されている汚濁水還流管12はブーム2に沿つて延長し、その汚濁水還流管12の他端部は、スクリュコンベヤ31の前部において前記ボックス6内に上方から挿通されて固定されている。

前記沈殿槽38内の下部にスラッジポンプ41が配置され、そのスラッジポンプ41の吐出口にスラッジ輸送管42の一端部が接続され、かつスラッジ輸送管42の他端部は、作業船1の側部の水上にある土運船43における泥槽の上方に配置され、さらに前記金網コンベヤ40の送出側端部の下部に、掘削屑粗粒子搬送用ベルトコンベヤ44

方向に回転させる。

このようにすると、前記カッタ5により水底地盤45が、巾広くかつ平坦な掘削面が生じるよう掘削され、さらに掘削屑は、スクリュコンベヤ31により掘削屑誘導部材35に沿つて掘削屑集合排出用ボックス6内に掻寄せ移動されたのち、掘削屑排出用ポンプ7により水と共に泥状物となつて吸引管8および掘削屑輸送管9を経て作業船1上の分離装置10における金網コンベヤ40の上に排出され、その金網コンベヤ40を通過した泥水は沈殿槽38に落下し、その沈殿槽38においてスラッジ50が沈殿すると共に、沈殿槽38から溢流した汚濁水が汚濁水貯槽39に貯溜される。

汚濁水貯槽39内の汚濁水は、還流水ポンプ11により汚濁水還流管12を経て掘削屑集合排出用ボックス6に供給されたのち、再び掘削屑排出用ポンプ7により吸引管8および掘削屑輸送管9を経て掘削屑と共に前記分離装置10に輸送され、掘削屑輸送用水として循環利用される。また金網

の受入側端部が配置され、そのベルトコンベヤ44の送出側端部は前記土運船43における泥槽の上方に配置される。

前記移動フレーム3の前方下部に、水底地盤45に設置される摺動支承板46が設けられ、その摺動支承板46の前部および後部の左右両側部分と移動フレーム3とは、平行に配置された支持リンク47を介して連結され、かつ移動フレーム3と摺動支承板46とは掘削深さ調節用液圧シリンダ48を介して連結されている。

作業船1はウインチから繋り出された8~12本の係船索49とその先端に連結された錨とによつて洋上に係留され、適宜の位置の係船索49を巻取りおよび巻戻すことにより、作業船1を任意方向に移動することができる。

作業船1により浚渫装置を第1図の矢印A方向に前進移動させて水底地盤45の浚渫を行なう場合は、カッタ駆動装置4によりドラム型のカッタ5を回転させると共に、コンベヤ駆動装置32によりスクリュコンベヤ31を掘削屑中央掻寄せ

コンベヤ40上の掘削屑の粗粒子は、その金網コンベヤ40およびベルトコンベヤ44により搬送されて土運船の泥槽43に供給され、さらに沈殿槽38内のスラッジ50は、スラッジポンプ41によりスラッジ輸送管42を経て搬送されて、土運船43の泥槽に供給される。

前記実施例の場合は、左右方向に延長するように配置されたドラム型のカッタ5により水底地盤45を巾広く掘削して浚渫能率を向上させることができ、かつ掘削屑は、スクリュコンベヤ31により掘削屑誘導部材35に沿つて誘導されて掘削屑集合排出用ボックス6内に集められ、次いでボックス6内の掘削屑は、掘削屑排出用ポンプ7の吸引管8により水と共に吸引されて排出されるので、巾広く掘削しても、ボックス6内に大きな吸引力を作用させて、掘削屑を容易にかつ確実に排出することができる。

前記実施例のよう、浚渫の際に水底付近を移動する移動フレーム3に掘削屑排出用ポンプ7を取り付けておけば、大きな揚程が得られるので、大

水深の浚渫を行なうことができる。また荒天の際は、浚渫装置を支持しているブーム2を浮上させると共に、作業船1とブーム2との連結を解いて、作業船1を緊急避難させることができる。

この発明を実施する場合、コンベヤ軸28に左螺旋翼または右螺旋翼を連続して設けてスクリューコンベヤの一端部を掘削屑集合排出用ボックス6に挿入してもよい。また前記カッタ5を掘下回転するように構成してもよく、あるいは掘上回転するように構成してもよい。

左右のドラム17, 20を一体に構成してもよく、またカッタ5および分離装置10としては図示以外の任意構造のものを使用してもよい。さらにまた前記スクリューコンベヤ31を省略し、前記掘削屑誘導部材35をボックス6から離れるにしたがつて前方に偏位するように傾斜させ、カッタ5により掘削された掘削屑を掘削屑誘導部材35により誘導してボックス6内に侵入させてもよい。

〔発明の効果〕

この発明によれば、カッタ5により掘削されて

図はドラムカッタ駆動部を示す縦断正面図、第7図はスクリューコンベヤと掘削屑誘導部材との関係を示す縦断側面図、第8図はスクリューコンベヤ駆動部を示す正面図、第9図は作業船と浚渫装置との関係を示す側面図である。

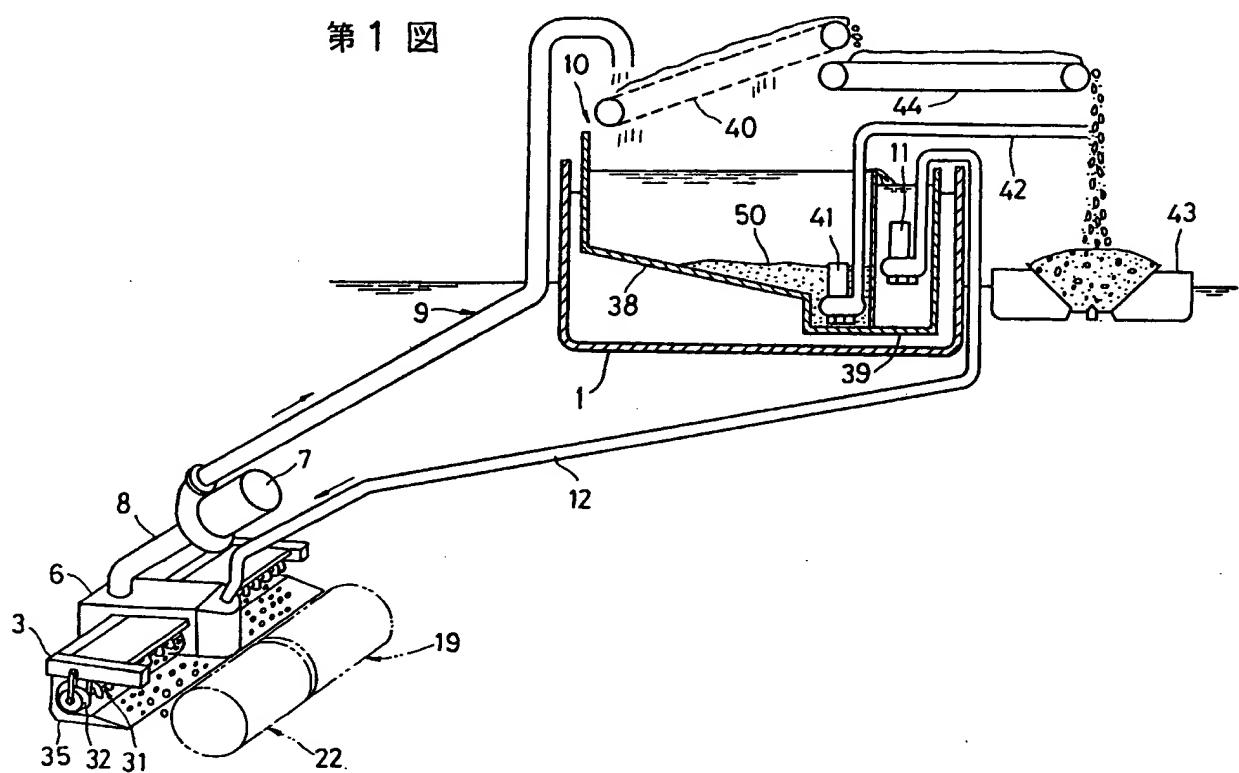
図において、1は作業船、2はブーム、3は移動フレーム、4はカッタ駆動装置、5はカッタ、6は掘削屑集合排出用ボックス、7は掘削屑排出用ポンプ、8は吸引管、9は掘削屑輸送管、10は分離装置、11は還流ポンプ、12は汚泥水還流管、13は支持枠、15は傾斜調整用液圧シリンダ、19および22はドラムカッタユニット、31はスクリューコンベヤ、32はコンベヤ駆動装置、35は掘削屑誘導部材、38は沈殿槽、39は汚泥水貯槽、40は金網コンベヤ、41はスラッジポンプ、42はスラッジ輸送管、43は土運船、44は掘削屑粗粒子搬送用ベルトコンベヤ、45は水底地盤、46は摺動支承板、47は支持リンク、48は掘削深さ調節用液圧シリンダである。

掘削屑集合排出用ボックス6内に侵入した掘削屑が、掘削屑排出用ポンプ7により水と共に吸引管8および掘削屑輸送管9を経て分離装置10に輸送され、その分離装置10において分離された汚泥水は、海中に放流されることなく、還流ポンプ11により汚泥水還流管12を経て前記掘削屑集合排出用ボックス6に還流され、掘削屑輸送用水として循環利用されるので、汚泥水による海水汚染を防止しながら浚渫を行なうことができ、さらに前記分離装置10から還流される汚泥水を、前記ボックス6内の掘削屑のスラリー化に利用すると共に、前記掘削屑排出用ポンプ7により輸送される掘削屑含有水の含泥率を高めることができ等の効果が得られる。

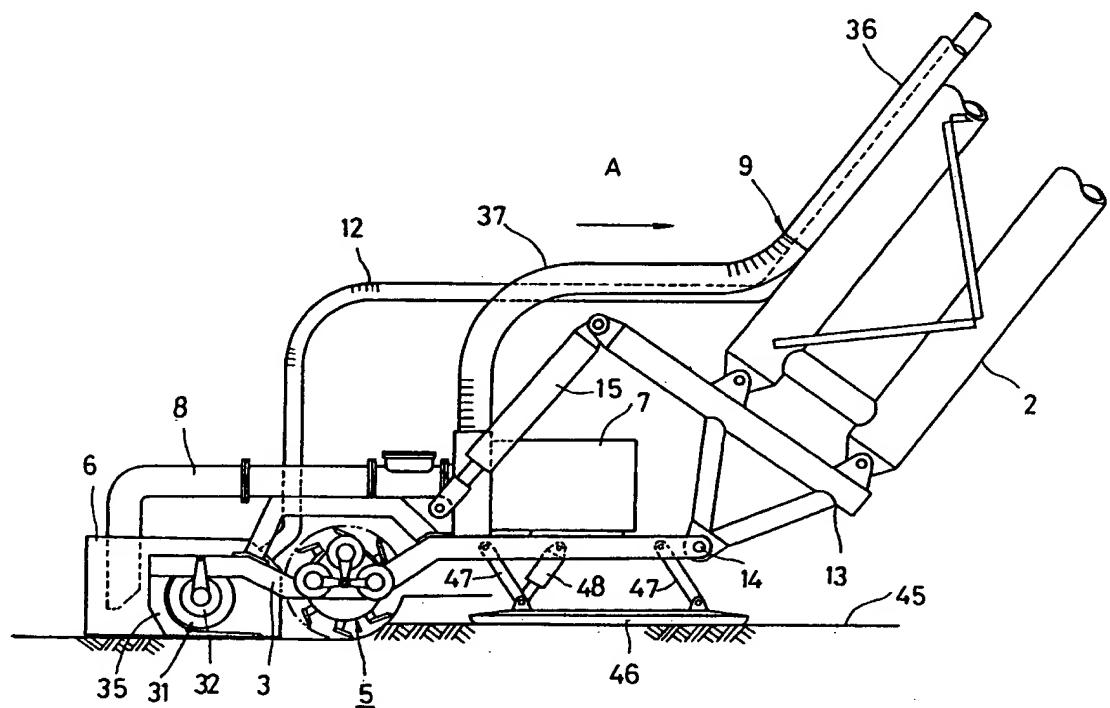
4. 図面の簡単な説明

図面はこの発明の一実施例を示すものであつて、第1図は汚泥水循環式浚渫装置の要部を示す概略図、第2図はその浚渫装置の一部を示す側面図、第3図はその横断平面図、第4図は浚渫装置の一部を示す側面図、第5図はその縦断側面図、第6

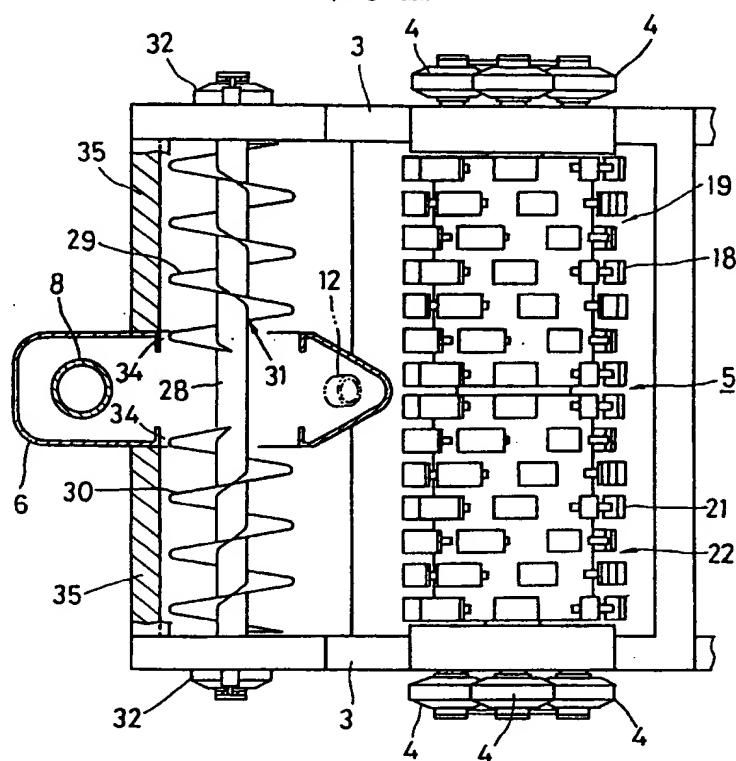
第1図



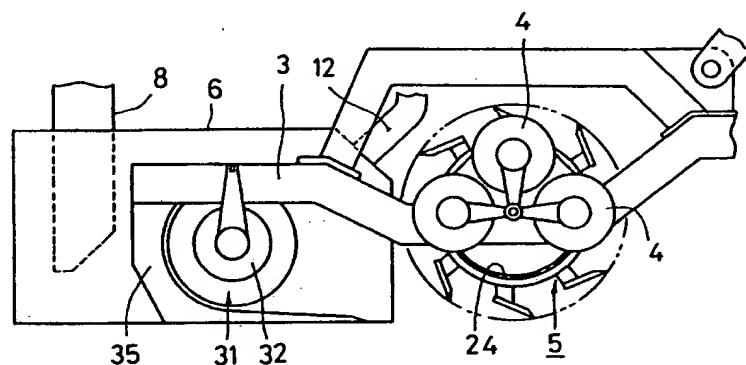
第2圖



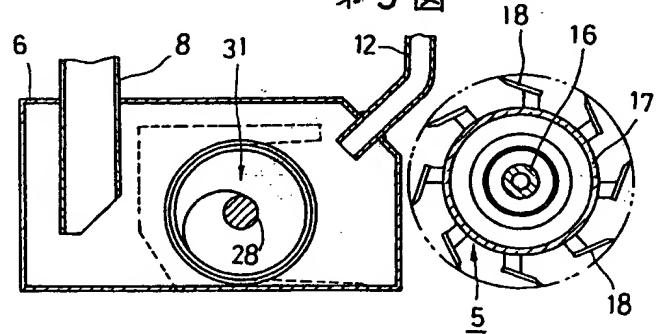
第3図



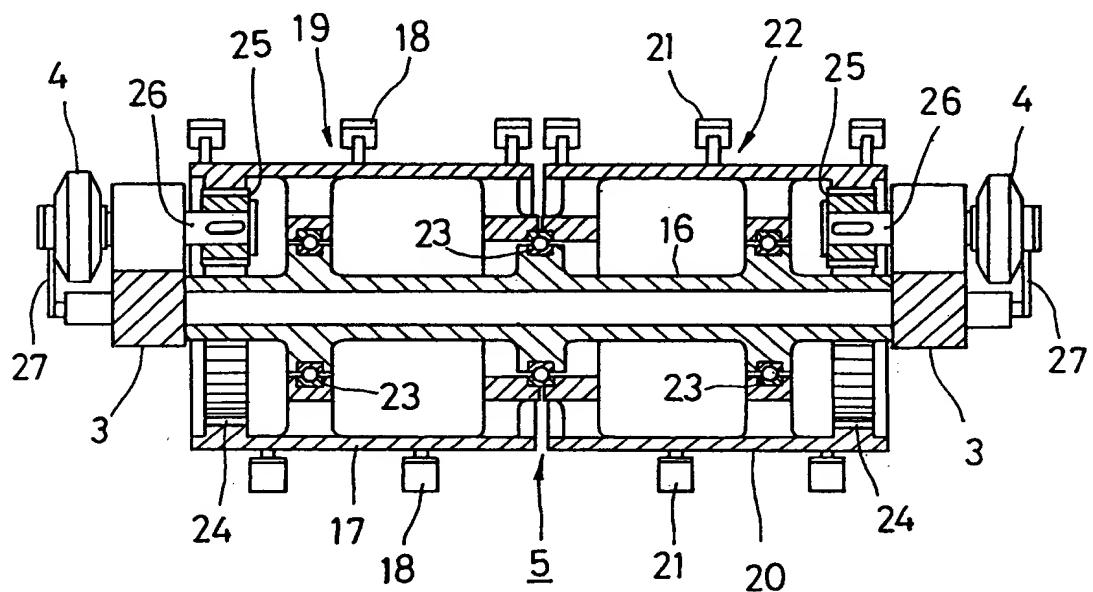
第4図



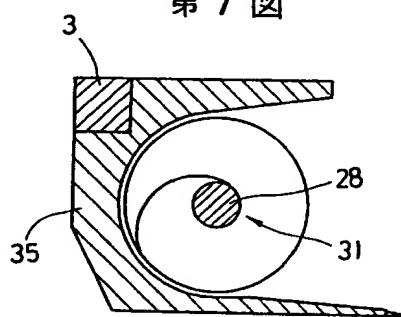
第5図



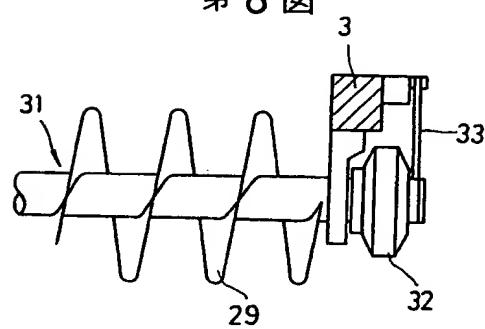
第6図



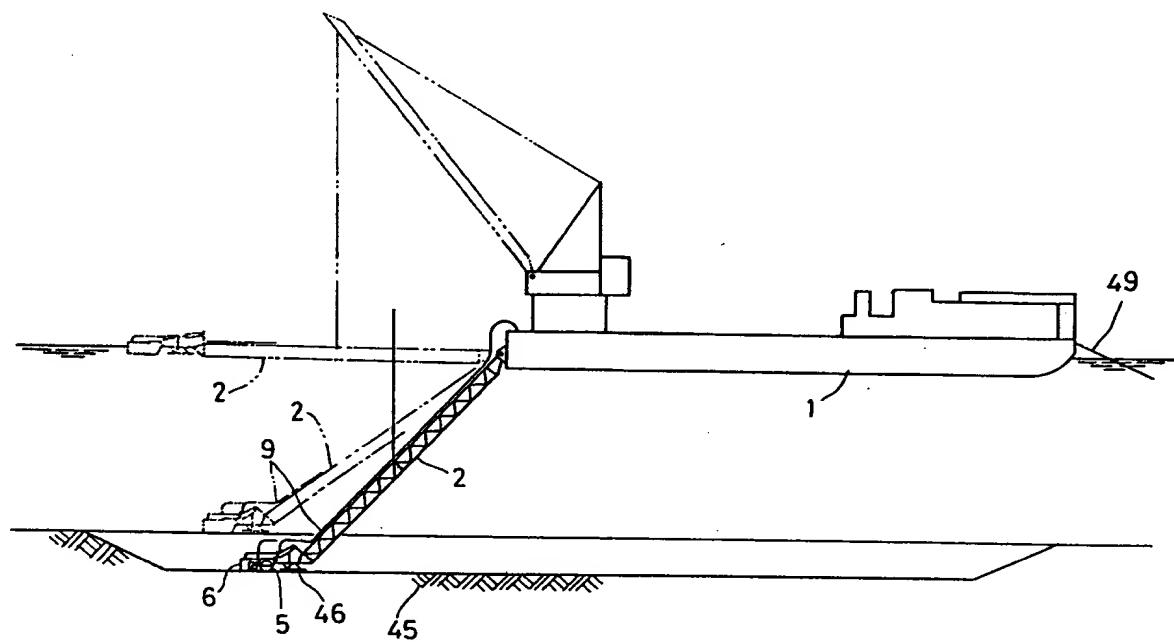
第7図



第8図



第9図



PTO 02-4950

Japanese Kokai Patent Application
No. Sho 62[1987]-225629

POLLUTED WATER CIRCULATION TYPE DREDGER

Takenori Watanabe, et al.

UNITED STATES PATENT AND TRADEMARK OFFICE
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POLLUTED WATER CIRCULATION TYPE DREDGER

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[There are no amendments to this patent.]

Claim

Polluted water circulation type dredger, characterized in that cutter (5), which is rotated by cutter drive apparatus (4), and box (6) for collecting and discharging excavated waste and which is arranged behind cutter (5), are attached to moving frame (3) which is moved forward supported on boom (2) that can be raised and lowered on working vessel (1), the suction pipe (8) of pump (7) for discharging excavated waste is connected to box (6), excavation waste transport pipe (9) which is connected to the discharge outlet of pump (7) is directed toward separating apparatus (10) for excavation waste and water furnished on working vessel (1), and the polluted water storage part of separating apparatus (10) and aforementioned box (6) are connected by polluted water return flow pipe (12) which has return flow water pump (11).

Detailed explanation of the invention

Industrial application field

This invention relates to a polluted water circulation type dredger which is used when the floor of a body of water is excavated.

Prior art

In the past, when the floor of a body of water is dredged, the excavation waste excavated by the cutter would be discharged directly to the mud hold or the working vessel or the barge as mud with water, the sand and earth would be left inside by precipitation, and the surplus clear water on top would be discharged into the sea by overflow.

Problems to be solved by the invention

However, the aforementioned surplus water is polluted water that includes fine particles of the excavated substances. The problem is that when this surplus water is discharged into the sea, the seawater around the dredged area will be contaminated and there are noticeable adverse effects on marine industries and the environment.

Objective and constitution of the invention

The purpose of this invention is to provide a polluted water circulation type dredger that can profitably solve the above-mentioned problems. The essential point of this invention is that it is a polluted water circulation type dredger that is characterized in that that cutter (5), which is rotated by cutter drive apparatus (4), and box (6) for collecting and discharging excavated waste and which is arranged behind cutter (5), are attached to moving frame (3) which is moved forward and supported on boom (2) which can be raised and lowered on working vessel (1), the suction pipe (8) of pump (7) for discharging excavated waste is connected to box (6), excavation waste transport pipe (9) that is connected to the discharge outlet of pump (7) is directed toward separating apparatus (10) for excavation waste and water furnished on working vessel (1), and the polluted water discharge part of separating apparatus (10) and aforementioned box (6) are connected by polluted water return flow pipe (12) which has return flow water pump (11).

Application example

Next, this invention is explained in detail with the example shown.

The figures show a polluted water circulation type dredger associated with one application example of this invention. The base end of truss-like boom (2) is connected by a horizontal shaft to be able to be raised and lowered to the back part of working vessel (1). Many flotation regulation chambers which are delineated to be side by side the length of the boom are furnished in the hollow

pipe body that constitutes boom (2) and a water fill and discharge valve is furnished for each flotation regulation chamber. The flotation of boom (2), its downward slant, and the ground contact pressure by the dredger attached to the tip part of boom (2) are regulated by filling and discharging water from the flotation regulation chambers to adjust the flotation of boom (2).

The forward end part of moving frame (3) is pivotally attached by horizontal shaft (14) to support frame (13) which is connected to the tip part of aforementioned boom (2). Support frame (13) and the middle part of moving frame (3) are connected by hydraulic cylinder (15) for regulating slant, and both ends of cutter support shaft (16), which extends left and right, are affixed to aforementioned moving frame (3).

Drum cutter unit (19), which is constituted with many excavating wings (18) attached side by side in many rows in the form of a leftward spiral around the outer circumference of drum (17), and drum cutter unit (22), which is constituted with many excavating wings (21) attached side by side in many rows in the form of a rightward spiral around the outer circumference of drum (20), are arranged to be side by side in series and are supported to be able to rotate with bearing (23) by aforementioned cutter support shaft (16). Pinion (25) which engages with inside cog gear wheel (24) furnished for each drum (17) and (20) is affixed to rotating shaft (26) that is coupled to the case in cutter drive apparatus (4), which is composed of a case rotating type hydraulic motor. Rotating shaft (26) is supported with a bearing by moving frame (3), and the other end of arm (27), one end of which is affixed to a nonrotating shaft in aforementioned cutter drive apparatus (4), is affixed to moving frame (3). Drum type cutter (5) is constituted by drum cutter units (19) and (22) that are rotated by cutter drive apparatus (4).

Left helical wing (29) and right helical wing (30) are affixed to the left side and right side on conveyor shaft (28) which extends to the left and right at the rear part of drum type cutter (5) to constitute screw conveyor (31). Both end parts of conveyor shaft (28) in screw conveyor (31) are supported with bearings by moving frame (3). At both ends of conveyor shaft (28), arm (33) is connected to the case in conveyor drive apparatus (32), composed of a case rotating type hydraulic motor, one end [of (33)] is affixed to the nonrotating shaft in conveyor drive apparatus (32), and the other end is affixed to aforementioned moving frame (3).

The top part of box (6) for collecting and discharging excavated waste that is arranged in the middle part of aforementioned screw conveyor (31) is affixed to moving frame (3). The scrape-in ends of left helical wing (29) and right helical wing (30) are inserted into open parts (34) furnished in the left and right sides of box (6). Excavation waste guide member (35), with a cross section in the form of a groove open at the front, and that encloses the rear part of screw conveyor (31) outside of box (6), is arranged to extend along screw conveyor (31) and is affixed to the side surfaces of moving frame (3) and box (6). The bottom surface of the arc-shaped groove in

aforementioned excavation waste guide member (35) is arranged to be near the rear parts of left helical wing (29) and right helical wing (30).

The suction end part of suction pipe (8) in excavated waste discharge pump (7), which is affixed to aforementioned moving frame (3), is inserted through aforementioned box (6) from the top and affixed farther to the back than screw conveyor (31). Hose (37) is connected to one end of metal pipe (36) that extends along boom (2) and a hose or flexible pipe body is connected to the other end of the metal pipe to constituted excavated waste transport pipe (9). Aforementioned metal pipe (36) is affixed to boom (2) and the end part of aforementioned hose (37) is affixed to the discharge outlet of excavated waste discharge pump (7).

Precipitating tank (38) and polluted water storage tank (39), which is adjacent to it, are furnished on aforementioned working vessel (1), and metal mesh conveyor (40) for separating excavated waste and polluted water, is furnished at the top part of precipitating tank (38).

Separating apparatus (10) is constituted with aforementioned precipitating tank (38), polluted water storage tank (39), and metal mesh conveyor (40). The discharge end of aforementioned excavation waste transport pipe (9) is arranged at the top part of the receiving end of metal mesh conveyor (40), return water pump (11) is arranged at the polluted water storage part of polluted water storage tank (39), and polluted water return pipe (12), one end of which is connected to the discharge outlet of return water pump (11), extends along boom (2). The other end of polluted water return pipe (12) is inserted through aforementioned box (6) from the top and affixed at the front part of screw conveyor (31).

Sludge pump (41) is arranged at the bottom part in aforementioned precipitating tank (38). One end of sludge transport pipe (42) is connected to the discharge outlet of sludge pump (41), and the other end of sludge transport pipe (42) is disposed above the mud hold in barge (43) which is on the water at the end part of working vessel (1). The receiving side end of conveyor belt (44) for transporting coarse particles in the excavated waste is further arranged at the bottom part of the output side end of aforementioned metal mesh conveyor (40). The output side end of conveyor belt (44) is arranged above the mud hold in aforementioned barge (43).

Slide support plate (46), which is mounted on underwater floor surface (45), is furnished at the forward bottom part of aforementioned moving frame (3). The forward part and both the left and right side portions of the rear part of slide support plate (46) and moving frame (3) are connected by support link (47) which is arranged parallel, and moving frame (3) and slide support plate (46) are connected by hydraulic cylinder (48) for regulating excavation depth.

Working vessel (1) is moored on the ocean by 8-12 mooring cables (49) that are paid out from a winch and by an anchor that is attached at the end. Working vessel (1) can be moved in any direction by winding up or unwinding mooring cables (49) at the appropriate position.

When the dredger is moved forward in the direction of arrow (A) in Figure 1 by working vessel (1) to dredge underwater floor surface (45), drum type cutter (5) is rotated by cutter drive apparatus (4) and screw conveyor (31) is also rotated to scrape in toward the middle part of the excavated waste by conveyor drive apparatus (32).

By so doing, underwater floor surface (45) is excavated by aforementioned cutter (5) so that a broad and flat excavating surface is produced, and in addition, the excavated waste is scraped and moved into box (6) for collection and discharge of excavated waste along excavation waste guide member (35) by screw conveyor (31). Then the muddy substance along with the water is passed through suction pipe (8) and excavated waste transport pipe (9) by excavated waste discharge pump (7), and they are discharged onto metal mesh conveyor (40) in separating apparatus (10) on working vessel (1). The muddy water that passes through metal mesh conveyor (40) drops into precipitating tank (38), sludge (50) precipitates in precipitating tank (38), and the polluted water that overflows from precipitating tank (38) is stored in polluted water storage tank (39).

The polluted water in polluted water storage tank (39) is passed through polluted water return pipe (12) by return water pump (11) and is supplied to box (6) for collecting and discharging excavated waste. Then it is passed through suction pipe (8) and excavated waste transport pipe (9) by excavated waste discharge pump (7) and transported to aforementioned separating apparatus (10) along with the excavated waste, where it is circulated and used as water for transporting the excavated waste. Coarse particles in the excavated waste on metal mesh conveyor (40) are transported by metal mesh conveyor (40) and conveyor belt (44) and supplied to mud hold (43) of the barge. In addition, the sludge (50) in precipitating tank (38) is transported through sludge transport pipe (42) by sludge pump (41) and is supplied to the mud hold of barge (43).

In the case of the aforementioned application example, underwater floor surface (45) is excavated broadly by drum type cutter (5), which is arranged to extend to the left and right, and dredging efficiency can be improved. The excavated waste is guided along excavated waste guide member (35) by screw conveyor (31) and is collected in box (6) for collection and discharge of excavated waste. Next the excavated waste in box (6) is sucked in along with the water by suction pipe (8) of excavated waste discharge pump (7) and is discharged, so even with broad excavation, a large suction force can act inside box (6) and the excavated waste can be discharged easily and reliably.

If excavated waste discharge pump (7) is attached to moving boom (3) that moves near the sea floor during dredging as in the aforementioned application example, a large degree of lifting is obtained, so dredging in deep water is possible. During rough weather, boom (2) that supports the dredger can be floated and the connection between working vessel (1) and boom (2) can be released, so danger to working vessel (1) can be avoided.

When this invention is implemented, a left helical wing or right helical wing may be furnished connected to conveyor shaft (28) and one end of the screw conveyor may be inserted into box (6) for collecting and discharging excavated waste. Aforementioned cutter (5) may be constituted to dig and rotate downward, or it may be constituted to dig and rotate upward.

Left and right drums (17) and (20) could also be constructed integrally, an any structures other than those shown could also be used as cutter (5) and separating apparatus (10). In addition, aforementioned screw conveyor (31) could also be eliminated, and by inclining aforementioned excavated waste guide member (35) so that it is displaced more forward as it is separated from box (6), excavated waste excavated by cutter (5) could be guided by excavated waste guide member (35) and sent into box (6).

Effect of the invention

With this invention, excavated waste that is excavated by cutter (5) and sent into box (6) for collecting and discharging excavated waste is passed through suction pipe (8) and excavated waste transport pipe (9) by excavated waste discharge pump (7) and is transported to separating apparatus (10). The polluted water that is separated at separating apparatus (10) is passed through polluted water return pipe (12) by return water pump (11), it is returned to box (6) for collection and discharge of excavated waste without being released into the sea and it is used for circulation as water for transporting the excavated waste. So the effects obtained are as follows. Dredging can be accomplished while contamination of the seawater by the polluted water is prevented. In addition, the polluted water that is returned from aforementioned separating apparatus (10) is used to make a slurry with the excavated waste in aforementioned box (6), and the mud content of the excavated waste containing water transported by aforementioned excavated waste discharge pump (7) can be increased.

Brief description of the figures

The figures show an application example of this invention. Figure 1 is a schematic diagram that shows the major parts of a polluted water circulation type dredger. Figure 2 is a side view that shows a part of that dredger. Figure 3 is a laterally cut plan view of the same. Figure 4 is a side view that shows a part of the dredger. Figure 5 is a longitudinally cut side view of the same. Figure 6 is a longitudinally cut front view that shows the drum cutter drive part. Figure 7 is a longitudinally cut side view that shows the relationship of the screw conveyor and the excavated waste guide member. Figure 8 is a front view that shows the screw conveyor drive part. Figure 9 is a side view that shows the relationship of the working vessel and the dredger.

In the figures (1) is a working vessel, (2) a boom, (3) a moving frame, (4) a cutter drive apparatus, (5) a cutter, (6) a box for collecting and discharging excavated waste, (7) an excavated

waste discharge pump, (8) a suction pipe, (9) an excavated waste transport pipe, (10) a separating apparatus, (11) a return water pump, (12) a polluted water return pipe, (13) a support frame, (15) a hydraulic cylinder for regulating slant, (19) and (22) are drum cutter units, (31) is a screw conveyor, (32) a conveyor drive apparatus, (35) an excavated waste guide member, (38) a precipitating tank, (39) a polluted water storage tank, (40) a metal mesh conveyor, (41) a sludge pump, (42) a sludge transport pipe, (43) a barge, (44) a conveyor belt for transporting coarse particles in the excavated sludge, (45) the underwater floor surface, (46) a slide support plate, (47) a support link, and (48) a hydraulic cylinder for regulating excavation depth.

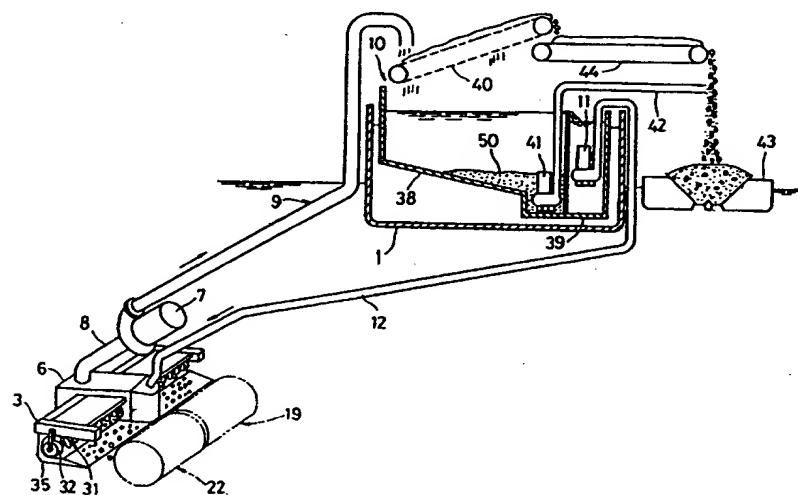


Figure 1

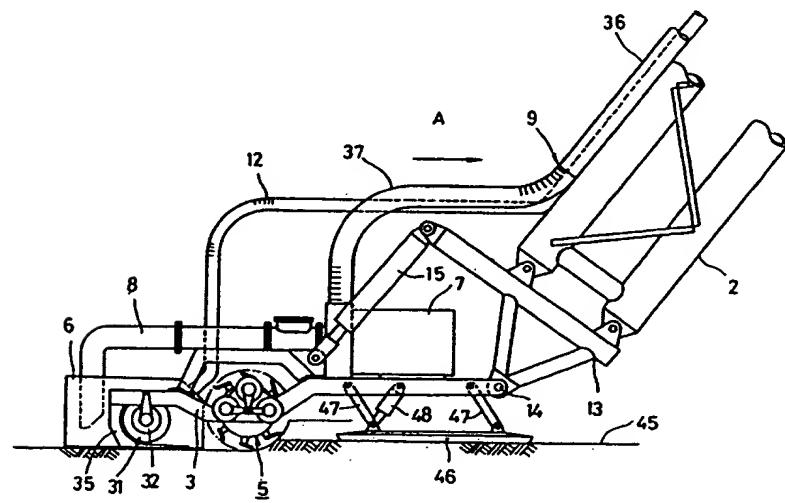


Figure 2

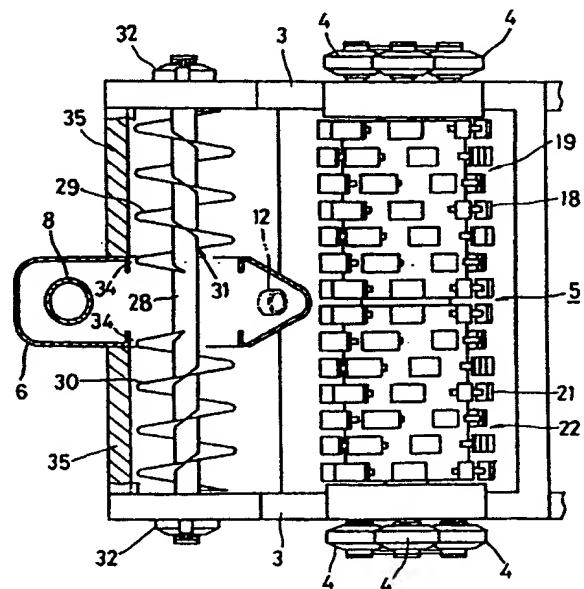


Figure 3

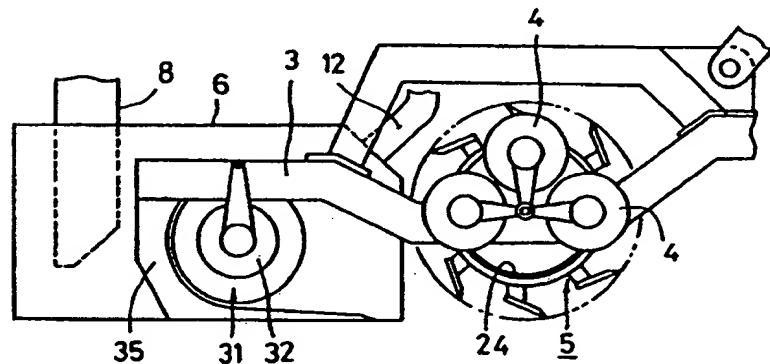


Figure 4

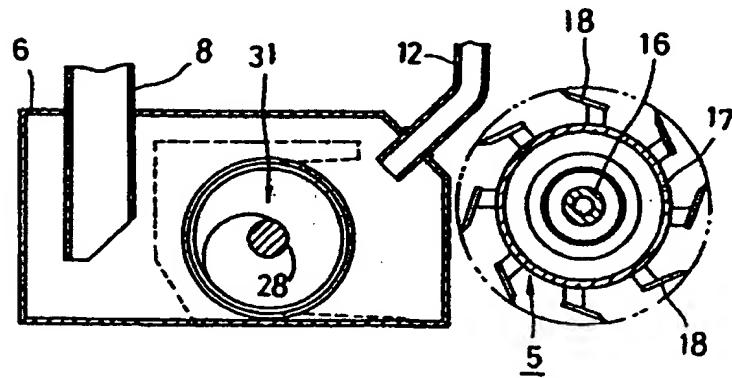


Figure 5

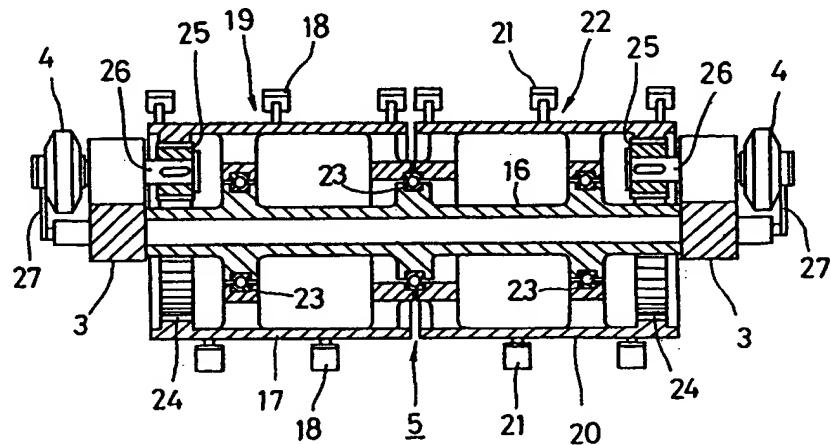


Figure 6

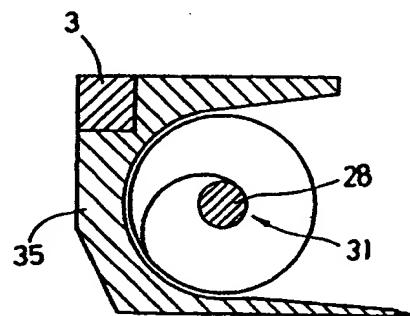


Figure 7

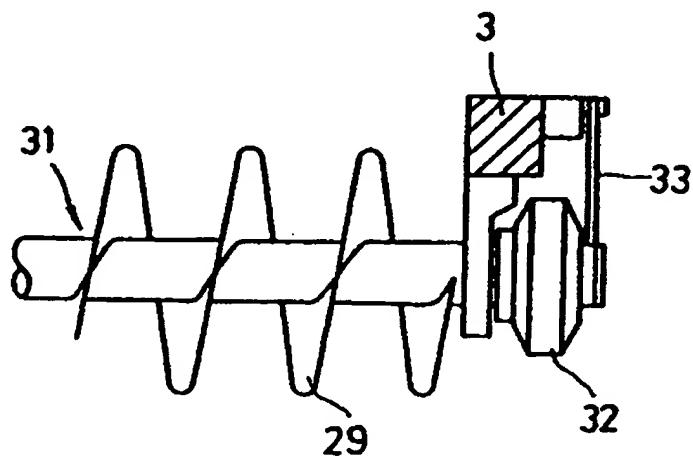


Figure 8

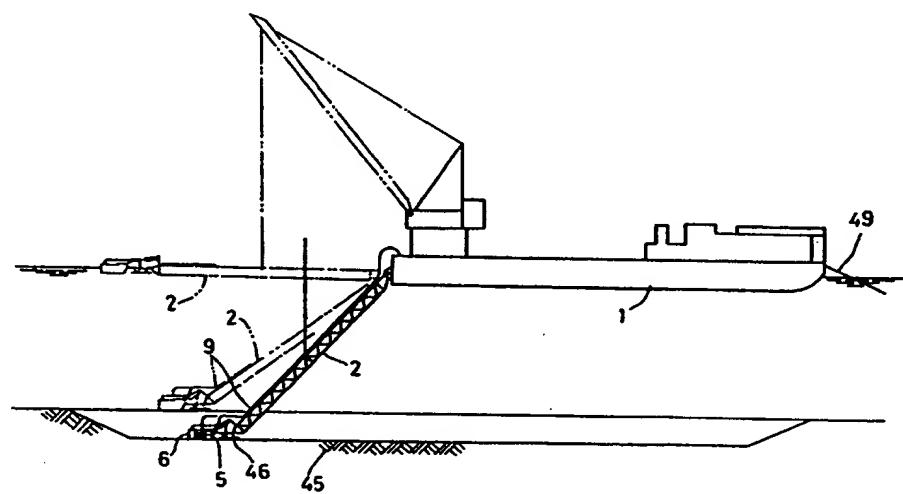


Figure 9